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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	OR209
Total Pages	35
First Named Inventor or Application Identifier	ELKINS
Express Mail Label No.	EI107215746US

JC549 U.S. PTO 09/127256 07/31/98

JC549 U.S. PTO 07/31/98

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

1. [X] Fee Transmittal Form Duplicate submitted *(Submit an original, and a duplicate for fee processing)*
2. [X] Specification [Total Pages 15] *(preferred arrangement set forth below)*
   - Descriptive title of the Invention
   - Cross References to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to Microfiche Appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings *(if filed)*
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
3. [X] Drawing(s) *(35 USC 113)* [Total Sheets 6]
4. Oath or Declaration [Total Pages 1]
   a. [X] Newly executed (original or copy)
   b. [ ] Copy from a prior application (37 CFR 1.63(d)) *(for continuation/divisional with Box 17 completed)* *[Note Box 5 below]*
      i. [ ] DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
5. [ ] Incorporation By Reference *(useable if Box 4b is checked)* The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
6. [ ] Microfiche Computer Program *(Appendix)*
7. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
   a. [ ] Computer Readable Copy
   b. [ ] Paper Copy (identical to computer copy)
   c. [ ] Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. [X] Assignment Papers (cover sheet & document(s)) — 2 pages including cover sheet and duplicate cover sheet
9. [ ] 37 CFR 3.73(b) Statement *(when there is an assignee)* [X] Power of Attorney
10. [ ] English Translation Document *(if applicable)*
11. [X] Information Disclosure Statement (IDS)/PTO-1449 — 3 pages including IDS and Citation [4] Copies of IDS Citations
12. [ ] Preliminary Amendment
13. [X] Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
14. [X] Small Entity Statement(s) [ ] Statement filed in prior application, Status still proper and desired
15. [ ] Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
16. [X] Other: 3 pages for:
    Certificate of Express Mailing
    Check for $476
    Petition to Make Special 1.102(c)

17. **If a CONTINUING APPLICATION,** *check appropriate box and supply the requisite information:*
    [ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) of prior application No: _____/_____

18. CORRESPONDENCE ADDRESS

[ ] *Customer Number or Bar Code Label* *(Insert Customer No. or Attach bar code label here)* or [X] *Correspondence address below*

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COMPLIANT HEAT EXCHANGE PANEL

BACKGROUND OF THE INVENTION

Field of the Invention

The invention relates generally to heat exchangers and more particularly to a thin flexible heat exchange panel for transferring heat to or from a complex shape such as a portion of a human body.

Description of the Prior Art

Compliant heat exchange panels are used for cooling a portion of a human body for physical therapy, pre-game day conditioning, minor injury care, post orthoscopic surgery recovery, and as a replacement for general air-conditioning. The heat exchange panels operate by transferring heat from the human body to a heat absorbing medium having a lower temperature than the body. The heat exchange panel may be passive where the medium is stationary within the panel or active where the medium, typically a liquid, flows through the panel. A common example of a passive heat exchange panel is an ice pack. A limitation of a passive heat exchange panel is that the panel or the medium must be changed when the temperature of the medium rises. An active heat exchange system is more expensive because an external apparatus is required to pump and re-cool the liquid. However, an active heat exchange system is preferable for many applications because it can operate continuously over a long period of time while maintaining a constant controllable temperature.

In order to achieve the best results in an active heat exchange panel, the flowing liquid at every point within the panel must have a nearly constant temperature and the panel

must be flexible in order to conform to the various complex shapes of the human body for thermal contact. These requirements are easier to meet when the heat exchange panel is very thin.

Figs. 1a and 1b are cross-sectional and plan diagrams, respectively, of a heat exchange panel of the prior art referred to by a reference number 100 and disclosed by William Elkins in United States patent numbers 4,884,304 and 5,033,136 for a "Bedding System With Selective Heating and Cooling". Similar heat exchange panels are disclosed by Elkins in United States patent numbers 3,830,676 for a "Process of Making a Controlled Thermal Device" and 4,691,762 for a "Personal Temperature Control System". The heat exchange panel 100 includes a first layer 102 and a second layer 104. The first layer 102 and the second layer 104 are sealed together at a common border 106 and at fences 108. A liquid 120 is pumped so that it flows into an inlet port 122, through channels 124 between the fences 108, and out of an outlet port 126. The pressure of the liquid 120 causes the channels 124 to bulge to a certain thickness that depends upon the spacing of the fences 108. The panel 100 makes external thermal contact at the bulges over the channels 124. The fences 108 should be spaced as close together as possible in order for the panel 100 to be as thin as possible. However, spacing the fences 108 closer together requires an increase in the number of fences 108 and thereby reduces the area of the channels 124 where the panel 100 can make thermal contact.

In the heat exchange panel 100, the border 106 and the fences 108 are straight and essentially without wrinkles or ripples. Unfortunately, the straight border 106 and fences 108 cause the panel 100 to buckle when it is expanded with the liquid 120. The buckling impedes the flow of the liquid 120 and prevents the panel 100 from conforming closely to complex shapes. Elastic material could be used to alleviate

these problems, however, the dimensions of elastic materials are more difficult to control.

Fig. 2a is a plan diagram of a heat exchange panel referred to by a reference number 200 that was developed in part to improve upon the heat exchange panel 100. The heat exchange panel 200 includes a first layer that is similar to the first layer 102 (Fig. 1a) and a second layer similar to the second layer 104 (Fig. 1a). The first layer and second layers of the panel 200 are sealed together at a common border 206, at fences 208, and at dots of a dot matrix 210. The dot matrix 210 is organized into first parallel lines, second parallel lines 213, and third parallel lines 214 for connecting each of the dots the nearest adjacent dots of the dot matrix 210. The lines 212-14 cross each other at angles of approximately 60°. A typical section 215 of the panel 200 is expanded in a Fig. 2b. The Fig. 2b shows each of the dots in the dot pattern is at the center of an arc of six nearest adjacent dots. The six adjacent dots form a hexagonal pattern 216. Groups of four dots consisting of the center dot and a contiguous three of the nearest adjacent dots form a parallelogram 217. The liquid 120 is pumped to flow into an inlet port 222, between the fences 208, in a nominal direction 225 through the dot matrix 210, and out of an outlet port 226.

The pressure of the liquid 120 causes the channels 224 to bulge between the dots of the dot matrix 210 to a certain thickness that depends upon the spacing of the dots. The panel 200 makes external thermal contact at these bulges. The dots of the dot matrix 210 should be spaced as close together as possible in order for the panel 200 to be as thin as possible for conforming to complex shapes of various portions of the human body and avoiding warm spots due to relative stagnation of the liquid flow. However, increasing the number of dots of the dot matrix 210 reduces the area of the bulges where the panel 200 can make thermal contact. Consequently, it is important to space the dots of the dot

matrix 210 as close together as possible while using a minimum number of dots. Unfortunately, while an improvement over the panel 100, the heat exchange panel 200 having the dot matrix 210 having the lines 212-14 crossing at angles of 60° with the hexagonal pattern 216 is not optimum in this respect.

The panel 200 differs from the panel 100 by having trapezoid and triangular shaped wrinkles in the border 206 and the fences 208. The wrinkles reduce the tendency to buckle when the panel 200 is inflated and enable the panel 200 to conform better to complex shapes as compared to the panel 100. However, the hard corners of the wrinkles decrease the laminar flow of the liquid 120 enabling thermal zones of warmer liquid to form, thereby reducing the performance of the heat exchange panel 200.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a compliant heat exchange panel that is superior to the prior art for conforming and making thermal contact to complex shapes and for providing a more uniform temperature.

Briefly, in a preferred embodiment, the heat exchange panel of the present invention includes first and second layers having seals between the layers at a common border, at fences, and at dots of a dot matrix. The dot matrix is organized into first parallel lines and second parallel lines that connect each of the dots to the nearest adjacent dots at a 90° angle. In an active heat exchange panel, the first and second parallel lines are generally 45° to the direction of fluid flow. The seals at the border and the fences are rippled with no sharp changes in direction.

An advantage of a heat exchange panel of the present invention is that a dot matrix attachment pattern is organized for providing a greater area of thermal contact by minimizing the number of dot attachments for a given panel thickness when inflated and maintaining a more constant panel thickness.

Another advantage of a heat exchange panel of the present invention is that border and fence seals are rippled thereby reducing buckling when the panel is inflated.

An advantage of an active heat exchange panel of the present invention is that a dot matrix pattern provides a more uniform temperature through better mixing of a fluid flow.

Another advantage of an active heat exchange panel of the present invention is that border and fence seals have smooth ripples thereby providing greater compliance and reducing areas of stagnation for a more uniform temperature.

These and other objects and advantages of the present invention will no doubt become obvious to those of ordinary

skill in the art after having read the following detailed description of the preferred embodiments which are illustrated in the various figures.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1a and 1b are plan and cross-sectional diagrams, respectively, of a first flexible heat exchange panel prior art;

Fig. 2a is a plan diagram of a second flexible heat exchange panel of the prior art;

Fig. 2b is an expanded section of the plan diagram of the heat exchange panel of Fig. 2a;

Figs. 3a and 3b are plan and cross-sectional diagrams, respectively, of a flexible heat exchange panel of the present invention;

Fig. 3c is an expanded section of the plan diagram of the heat exchange panel of Figs. 3a-b; and

Fig. 4 is a block diagram of a system of the present invention using the heat exchange panel of Figs. 3a-c.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figs. 3a and 3b are a plan and a cross-sectional diagram, respectively, of a heat exchange panel of the present invention and referred to by a reference number 300. The heat exchange panel 300 includes a first layer 302 and a second layer 304. The first layer 302 and the second layer 304 are sealed together at a common border 306, at fences 308, and at dots of a dot matrix 310. Preferably, the common border 306 is near to the perimeters of the first layer 302 and the second layer 304 but it does not need to be at the exact outside of the first layer 302 or the second layer 304. The dot matrix 310 is organized into first parallel lines 312 and second parallel lines 314 for connecting each of the dots to the nearest adjacent dots of the dot matrix 310. The lines 312 and 314 are approximately perpendicular within a range $\pm 20°$. In contrast, in the prior art panel 200 (Figs. 2a-b) the lines 212-14 (Figs. 2a-b) cross at angles of about 60°, thereby requiring a greater number of dots in the dot matrix 210 (Figs. 2a-b) and reducing the area of thermal contact unless the panel 200 is allowed to be thicker.

In a passive application, the panel 300 is filled with a gel, a liquid, or other flexible medium having a desired temperature for transferring heat to or from an external body. The panel 300 is then wrapped about an external body in a manner to make the greatest area of thermal contact in order to transfer heat between the body and the medium. Typically, the panel 300 is used for cooling a limb, torso, neck, or head of a human being. The medium is replaced when its temperature increases or decreases outside of a desirable range. However, preferably, the panel 300 is used in an active application where a fluid 320 is pumped to flow into an inlet port 322, between the fences 308, through channels 324 in a nominal direction 325 around and past the

dots of the dot matrix 310, and out of an outlet port 326. The movement of the fluid 320 around the dots of the dot matrix 310 causes a continuous mixing of the fluid 320. The mixing is important for avoiding warm spots and maintaining a uniform temperature. In order to promote such mixing, clear channels are avoided between the dots of the dot matrix 310 by arranging the first lines 312 and the second lines 314 at angles between 25° and 65°, preferably about 45°, with respect to the nominal direction 325 of flow of the fluid 320. Fig. 3c shows an expanded view of a typical section 330 of the panel 300. Each of the dots in the dot pattern is a corner of a square pattern 332.

The dots of the dot matrix 310 may be customized at the bends of the channels 324 to maintain an angle of approximately 45° of the lines 312 and 314 to the direction of the flow of the fluid 320 in the locality of the bends. In contrast, in the prior art panel 200 (Figs. 2a-b) the second parallel lines 213 (Figs. 2a-b) are generally arranged parallel to the nominal direction 225 (Figs. 2a-b) of the flow of the liquid 120 resulting in clear channels where the liquid 120 (Figs. 2a-b) can avoid mixing. The border 306 and the fences 308 are smoothly rippled with ripple cycle lengths that are substantially less than the lengths of the border 306 or the fences 308. Such ripples further promote mixing of the fluid 320. The inlet port 322 and the outlet port 326 are preferred to have openings in the seal in the border 306 as shown in Fig. 3a. The ports 322 and 326 may be reversed, thereby reversing the nominal direction 325 of fluid flow. Alternatively, the inlet port 322 and/or the outlet port 326 may have openings in the first layer 302 or the second layer 304. Preferably, the fluid 320 is a liquid, however, a gas may be used. In a preferred embodiment, the dots of the dot matrix 310 have a diameter of about 0.100 inches and a center to center spacing of about 0.250 inches when the panel 300 is flat.

When the panel 300 is filled with the medium or fluid, the channels 324 bulge to a height of about 0.060 to 0.080 inches high by about 0.100 to 0.120 inches wide. The first layer 302 and the second layer 304 are an impermeable laminate having a fabric, such as Nylon, and three layers of Ether-based Polyurethane. The first layer of Polyurethane applied to the fabric has a relatively low density, the second layer has a relatively high density, and the third layer has a relatively low density in the laminating process that is available from Highland Industries of Framingham, Massachusetts. A Radio Frequency (RF) heat sealing process available from Ocean Vendors of Byron, California, is used for sealing the first layer 302 to the second layer 304 at the border 306, the fences 308, and the dots of the dot matrix 310 so that the fabric of the laminate is on the outside of the panel 300. Plates for the sealing process are made of Magnesium with a photo engraving process available from Custom Photo Engraving of Redwood City, California. Further information for the materials and processes for constructing the heat exchange panel 300 is disclosed by William Elkins in the 3,830,676, 4,691,762, 4,884,304, and 5,033,136 patents incorporated herein by reference.

Fig. 4 is a block diagram of a preferred embodiment of a system of the present invention and referred to by a reference number 400. The system 400 includes at least one heat exchange panel 300, the fluid 320, a heat transfer device such as a heater or a cooler 402 having a temperature control, a reservoir/pump 404, and conduits 406, 408, and 410. The cooler 402 cools the fluid 320 to a selected temperature and passes the cooled fluid 320 through the conduit 406 to the heat exchange panel 300. The cooled fluid 320 passes through the heat exchange panel 300 where it absorbs or passes heat energy through the first layer 302 and/or the second layer 304 from or to a human body or other

external source of heat that is to be cooled or heated. From the heat exchange panel 300 the fluid 320 passes through the conduit 408 to the reservoir/pump 404. The reservoir/pump 404 stores a supply of the fluid and pumps the fluid 320 through the conduit 410 to the cooler 402 completing a fluid circuit.

Although the present invention has been described in terms of the presently preferred embodiments, it is to be understood that such disclosure is not to be interpreted as limiting. Various alterations and modifications will no doubt become apparent to those skilled in the art after having read the above disclosure. Accordingly, it is intended that the appended claims be interpreted as covering all alterations and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

IN THE CLAIMS

1. A heat exchange panel, comprising:

a first layer;

a second layer having a common border with the first layer;

a border seal for sealing the first layer and the second layer at said border; and

a dot matrix of attachments between the first layer and the second layer and within said border, the dot matrix organized into first lines and second lines for connecting dots of said dot matrix to nearest dots of said dot matrix, said first lines crossing said second lines at an angle in a range of about 70° to 110°.

2. The panel of claim 1, wherein:

the heat exchange panel is for passing a flow of a fluid; and

said first lines and said second lines have an angle in a range of about 25° to 65° with respect to a nominal direction of said flow of said fluid.

3. The panel of claim 1, wherein:

the border seal includes smooth ripples having ripple lengths substantially shorter than the length of said border.

4. The panel of claim 1, further comprising:

a first port for passing a fluid into the panel.

a second port for passing said fluid out of the panel; and

at least one fence for sealing the first layer and the second layer between the first port and the second port.

5. The panel of claim 4, wherein:

the fence includes smooth ripples having ripple lengths substantially shorter than the length of the fence.

6. A method of manufacturing a heat exchange panel, comprising steps of:

sealing a first layer to a second layer at a common border; and

attaching said first layer to said second layer within said border with a dot matrix of attachments, said dot matrix organized for connecting dots of said dot matrix to nearest dots of said dot matrix, said first lines crossing said second lines at an angle in a range of about 70° to 110°.

7. The method of claim 6, wherein:

said heat exchange panel is for passing a flow of a fluid; and

one of (i) said first lines and (ii) said second lines has an angle in a range of about 25° to 65° with respect to a nominal direction of said flow of said fluid.

8. The method of claim 6, wherein:

the step of sealing includes sealing said first layer to said second layer with a border seal having smooth ripples having ripple lengths substantially shorter than the length of said border.

9. The method of claim 6, further comprising steps of:

constructing first and second ports for passing a fluid into and out of said panel; and

sealing said first layer to said second layer with at least one fence between said first port and said second port, said fence having smooth ripples having ripple lengths substantially shorter than the length of said fence.

10. A method for exchanging heat, comprising steps of:

receiving a fluid flow in a first port;

restricting a passage of said fluid flow between a first layer and a second layer;

further restricting said passage with a border seal at a common border between said first layer and said second layer;

passing said fluid flow through a dot matrix of attachments organized into first lines and second lines connecting dots of said dot matrix to nearest dots of said dot matrix, said first lines crossing said second lines at an angle in a range of about 70° to 110°; and

issuing said fluid flow through a second port.

11. The method of claim 10, wherein:

one of (i) said first lines and (ii) said second lines has an angle in a range of about 25° to 65° with respect to a nominal direction of said fluid flow.

12. The method of claim 10, wherein:

said border seal includes smooth ripples having ripple lengths substantially shorter than the length of said border.

13. The method of claim 10, further comprising a step of:

further restricting said fluid flow with at least one fence between said first port and said second port.

14. The method of claim 13, wherein:

said fence includes smooth ripples having ripple lengths substantially shorter than the length of the sealing fence.

15. A system for exchanging heat; comprising:

a heat transfer device for one of cooling or heating a fluid;

a pump/reservoir coupled to the heat transfer device for storing and pumping said fluid; and

a heat exchange panel coupled to the pump/reservoir and the heat transfer device, the heat exchange panel including a first layer, a second layer having a common border with the first layer, a border seal for sealing said first layer and said second layer at said border, a first port for receiving said fluid, a second port for issuing said fluid, and a dot matrix of attachments between said first layer and said second layer, said dot matrix organized for connecting dots of said dot matrix to nearest dots of said dot matrix, said first lines crossing said second lines at an angle in a range of about 70° to 110°.

16. The system of claim 15, wherein:

one of (i) said first lines and (ii) said second lines has an angle in a range of about 25° to 65° with respect to a nominal direction of a flow of said fluid.

17. The system of claim 15, wherein:

said border seal includes smooth ripples having ripple lengths substantially shorter than the length of said border.

18. The system of claim 15, wherein:

the heat exchange panel further includes at least one fence for sealing said first layer and said second layer between said first port and said second port.

19. The panel of claim 18, wherein:

said fence includes smooth ripples having ripple lengths substantially shorter than the length of said fence.

ABSTRACT OF THE DISCLOSURE

A heat exchange panel for use in an active heat exchange system. The heat exchange panel includes first and second layers having seals between the layers at a common border, at fences, and at dots of a dot matrix. The dot matrix is organized into first parallel lines and second parallel lines where the first and second parallel line cross at a 90° angle. The seals at the border and the fences are rippled with smooth ripples.

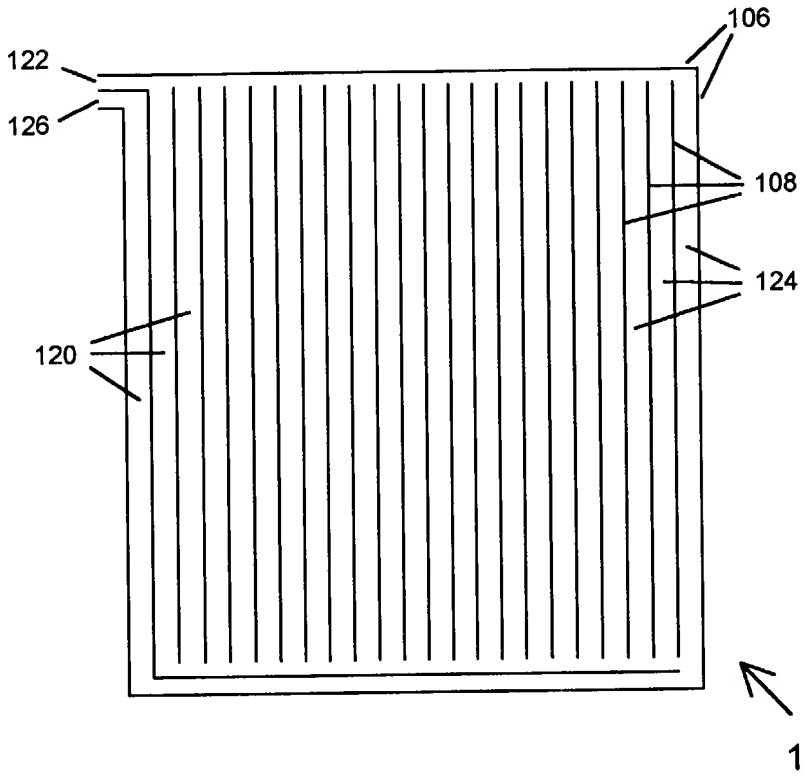


Fig. 1A

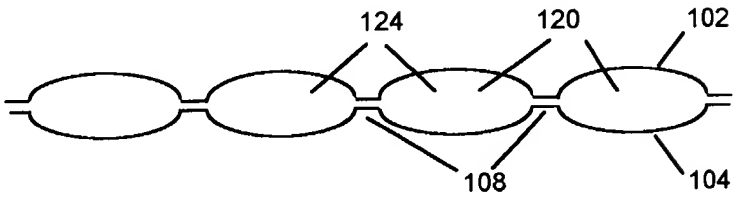


Fig. 1B

Fig. 2A

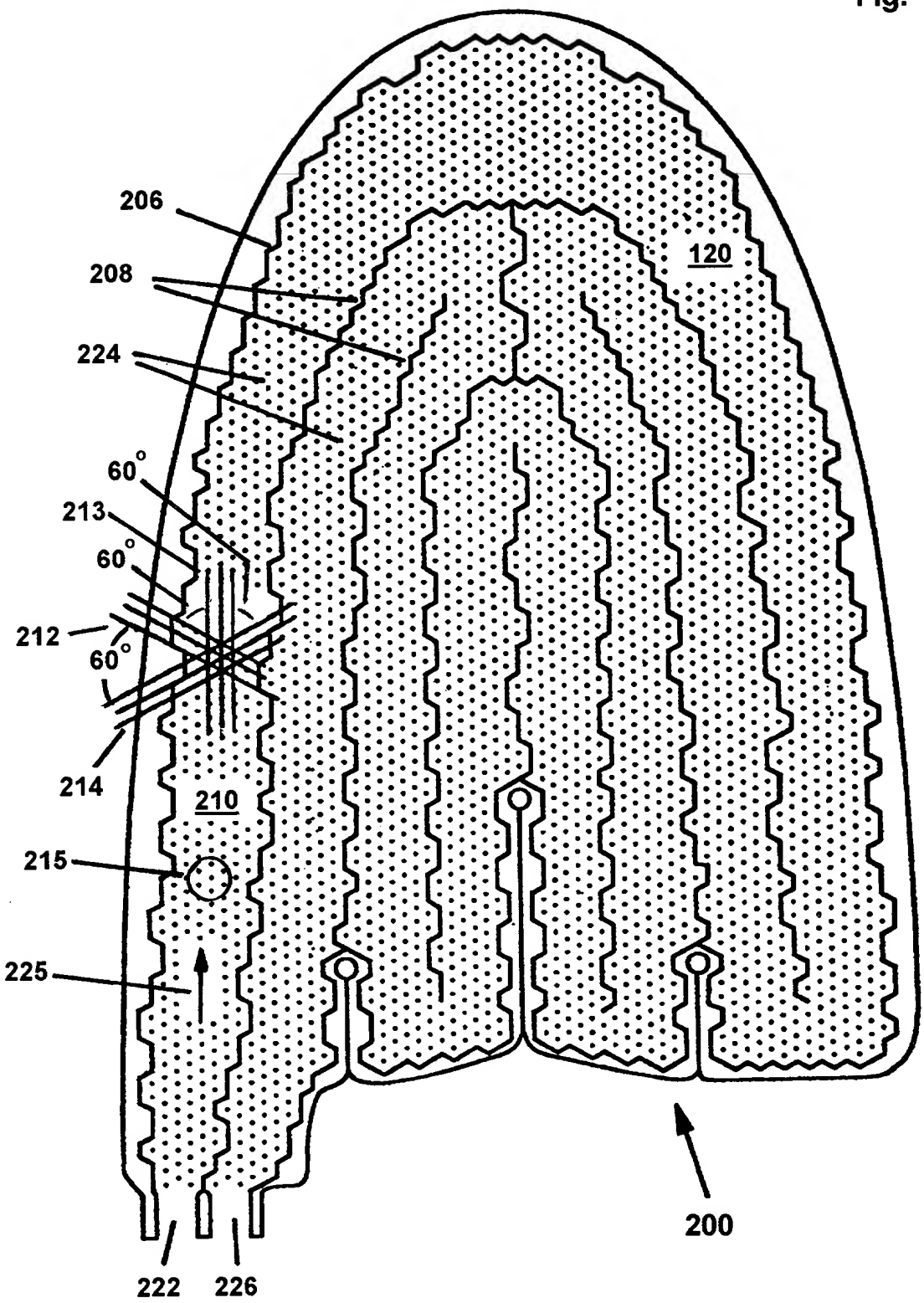
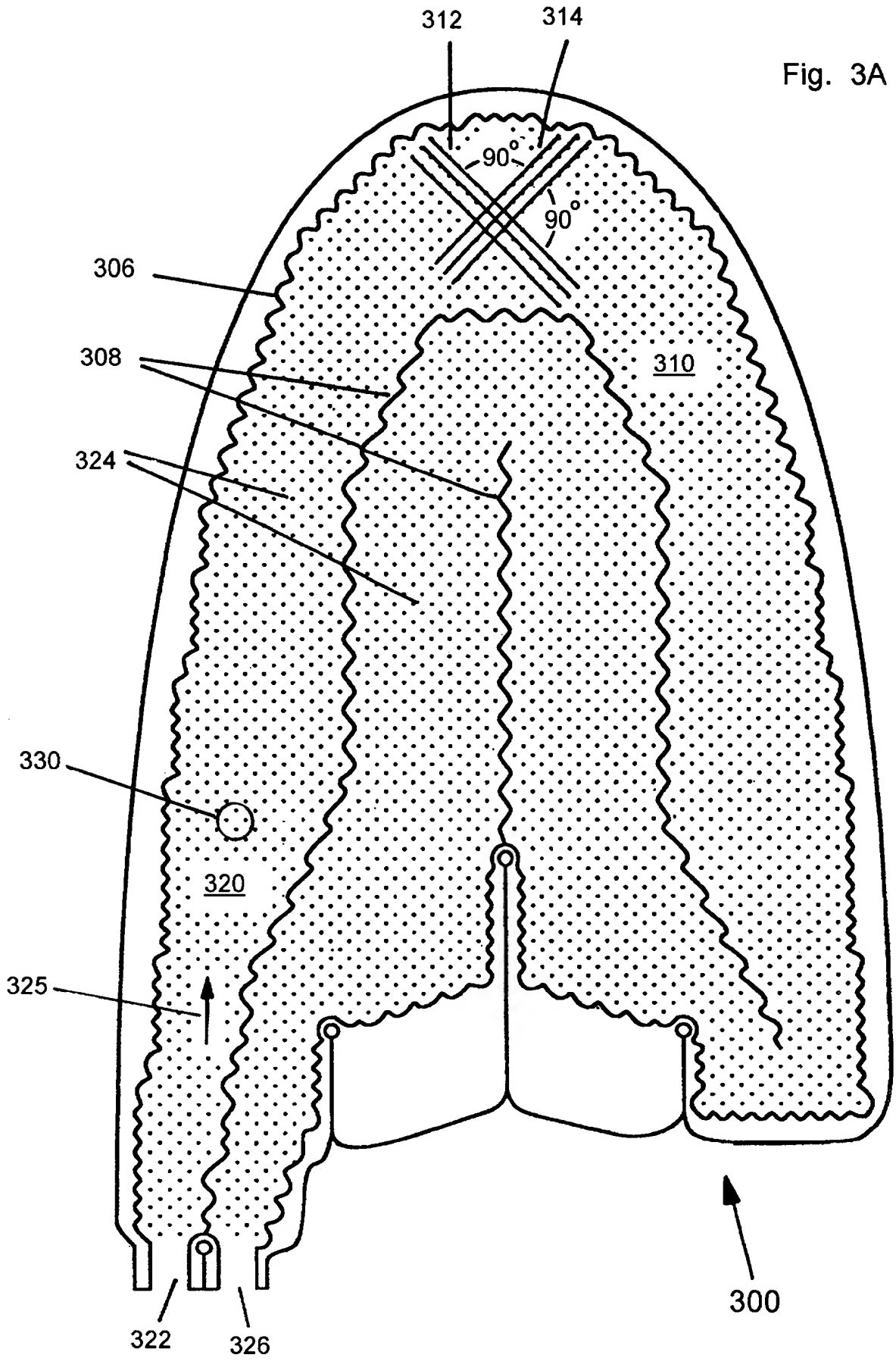


Fig. 3A



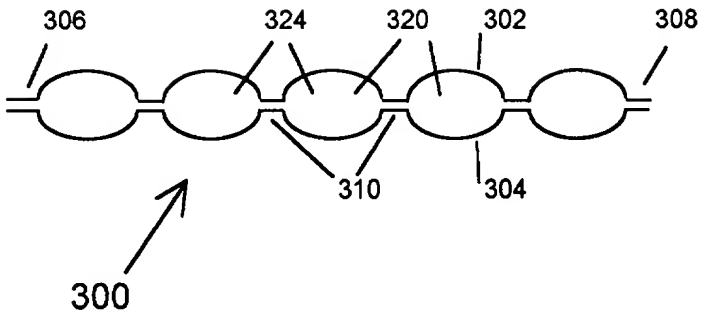


Fig. 3B

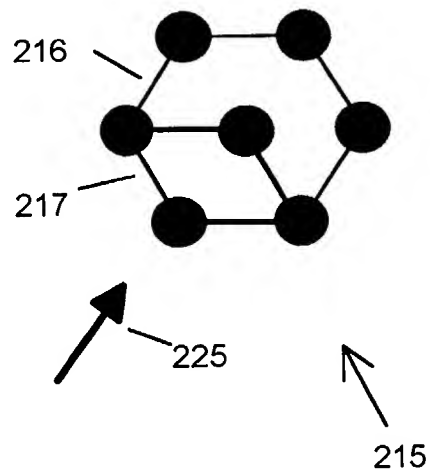


Fig. 2B

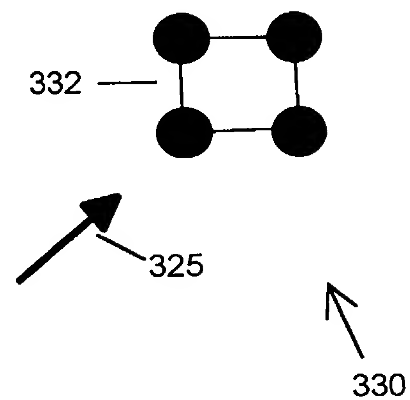


Fig. 3C

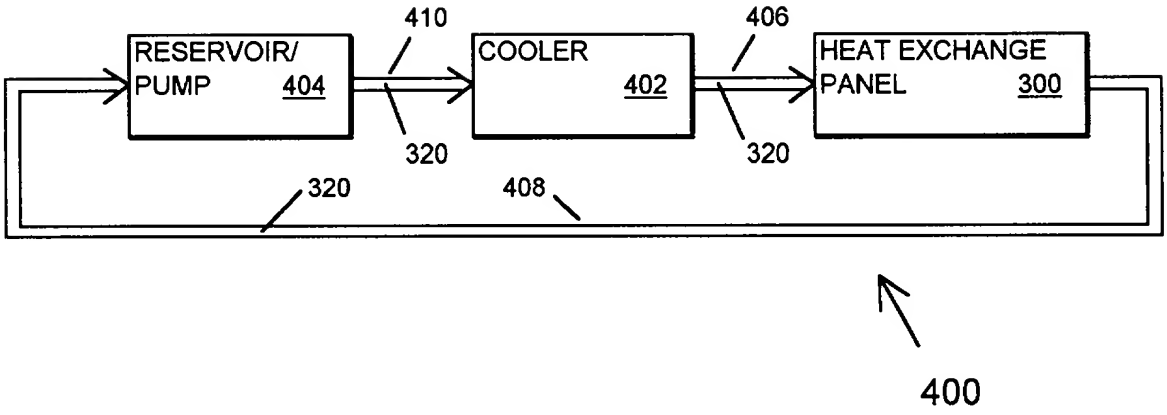

RESERVOIR/
PUMP 404
410
COOLER
402
406
HEAT EXCHANGE
PANEL 300
320
320
320
408
400

Fig. 4

DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated next to my name and that I believe that I am the original, first and sole inventor (if only one inventor is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: COMPLIANT HEAT EXCHANGE PANEL, the specification of which *(check one)*

_x_ is attached hereto as Docket No. OR209 or

___ was filed on _____ as Application Serial No. _____ and

was amended on _____ *(if applicable)*.

I hereby state that I have reviewed and I understand the contents of the above-identified specification, including the claims, as amended by any amendments referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate have a filing data before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed
_____ *(Number)*	_____ *(Country)*	_____ *(Day/Month/Year Filed)*	__ Yes __ No
_____ *(Number)*	_____ *(Country)*	_____ *(Day/Month/Year Filed)*	__ Yes __ No

I hereby claim benefit under Title 35, United States Code, 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, Unites States Code, 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulation, 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing data of this application:

_____ *(Application Serial No.)*	_____ *(Filing Date)*	Status: ___ *Patented* ___ *Pending* ___ *Abandoned*
_____ *(Application Serial No.)*	_____ *(Filing Date)*	Status: ___ *Patented* ___ *Pending* ___ *Abandoned*

I hereby declare that all statements made herein of my own knowledge are true, that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Title 18, United States Code, 1001, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Inventor: William Elkins

Signature of Inventor: _____ Date: 30 July 1998

Residence: San Jose, California

Citizen of: United States of America

Post Office Address: 7081 Galli Drive, San Jose, California 95129-3730

PATENT APPLICATION TRANSMITTAL LETTER

Applicant: William Elkins
Title: COMPLIANT HEAT EXCHANGE PANEL

Calculation of fees payable for filing of patent application:

	Number filed	Number std	Number extra	Rate	Fee
Basic filing fee					$790
Total claims	19	20	0	$22	$0
Independent claims	4	3	1	$82	$82
Multiple dependent claims present	0	0	0	$270	$0
Intermediate total					$ 872
Small Entity intermediate total					$436
Fee for recordation of assignment of patent application					$40
Total					$476

A check in the amount of the total is enclosed to cover the filing fees.

Please address all future correspondence to:

David R. Gildea, 435 Hermosa Way, Menlo Park, CA 94025, telephone (650) 853-0189

Date: 07/31/98
Docket No. OR209

David R. Gildea
Reg. No. 38,465

Applicant: William Elkins
Title: COMPLIANT HEAT EXCHANGE PANEL
U.S. Serial No. _____
Date Filed: _____

Group Art Unit: _____
Examiner: _____

SMALL ENTITY DECLARATION- SMALL BUSINESS CONCERN

I hereby declare that I am an officer of the small business concern empowered to act on behalf of the concern identified below:

Name of concern: ORISA Technologies Corporation

Address of concern: 600 Hobart Street, Menlo Park, California 94025

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18 and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35 United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the above entitled invention of the above applicants and the specification filed herewith.

I acknowledge a duty to file, in the above application for patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

[signature] 30 July 1998
Signature of Officer of Small Business Concern date

VICE PRESIDENT WILLIAM ELKINS
Name and Title of Officer

600 HOBART ST., MENLO PARK, CA 94025
Address of Officer